Washington Park Arboretum

BULLETIN

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Washington Park Arboretum

The Arboretum is a 230-acre dynamic garden of trees and shrubs, displaying internationally renowned collections of oaks, conifers, camellias, Japanese and other maples, hollies and a profusion of woody plants from the Pacific Northwest and around the world. Aesthetic enjoyment gracefully co-exists with science in this spectacular urban green space on the shores of Lake Washington. Visitors come to learn, explore, relax or reflect in Seattle's largest public garden.

The Washington Park Arboretum is managed cooperatively by the University of Washington Botanic Gardens and Seattle Parks and Recreation; the Arboretum Foundation is its major support organization.

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The Arboretum Foundation's mission is to create and strengthen an engaged community of donors, volunteers and advocates who will promote, protect and enhance the Washington Park Arboretum for current and future generations.

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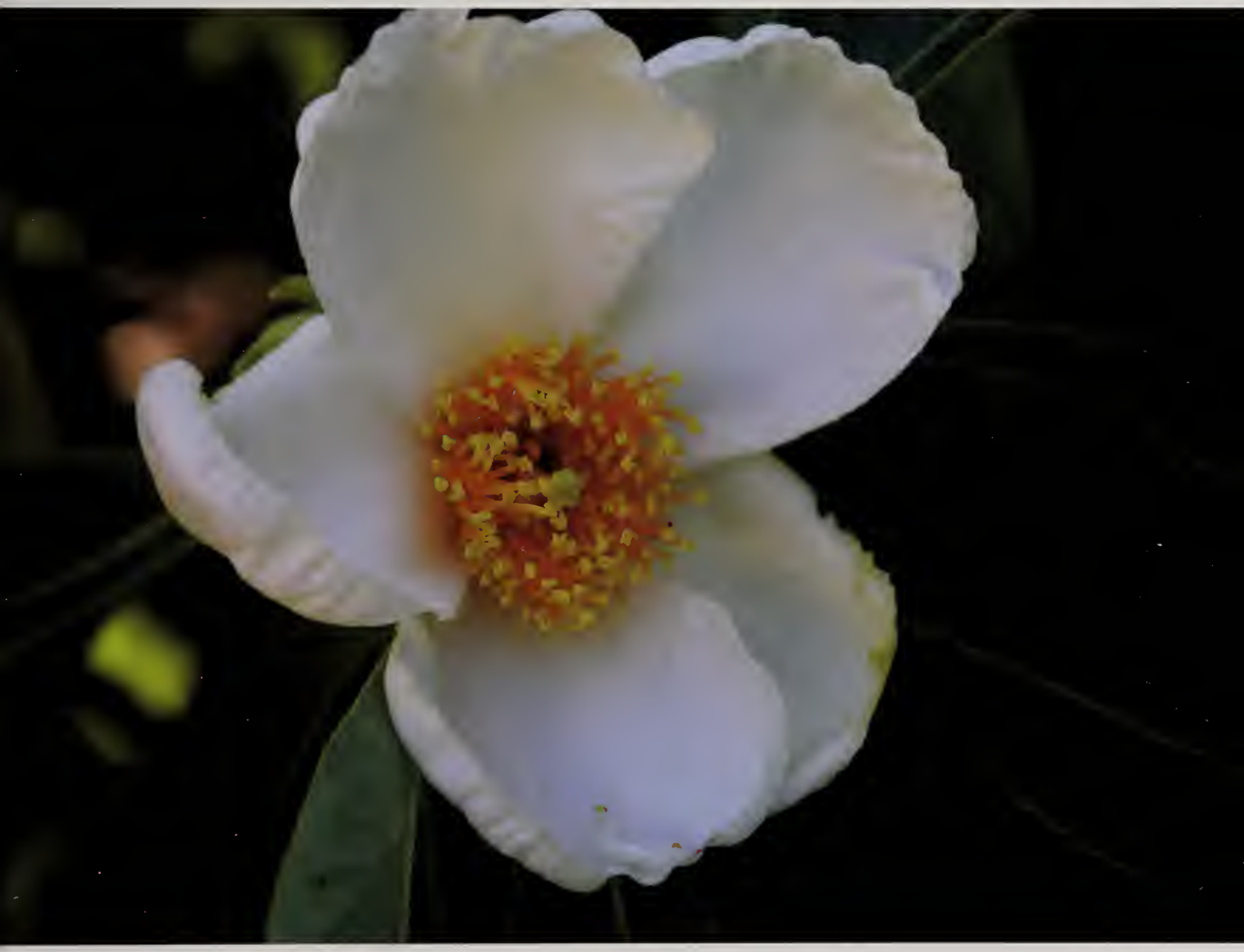


ABOVE: A Franklin tree (*Franklinia alatamaha*) blooming at the north end of Azalea Way in late summer.

ON THE COVER: Rhododendron Glen at Washington Park Arboretum provides serenity and cooling shade during hot summer days.

Randall

Edgar. Ichiro. Macklemore. These folks are iconic in Seattle. We know them instantly by one name only. The Arboretum has its own one-name icon, someone everyone speaks of by his first name only: Randall.

Randall Hitchin is the guru of the Arboretum. He is the one everyone turns to for help or advice. "Randall, here is this leaf from a plant that grows in my back yard. Can you identify it for me?" "Randall, here is a picture of a really cool shrub in the Witt Winter Garden. What is it?" "Randall, our unit is having a meeting in the Arboretum next month. Will you give us a tour?"

And, whatever the request, Randall responds. He'll stroke his chin, peer over his glasses, and then share his thought with a turn of phrase that is unique, fun and memorable. If you have taken an Arboretum tour with him, you have heard his vivid word pictures. How the native peoples used the big leaf maple and its enormous leaves: "like a giant paper towel dispenser." The contents of the sewer main that is built into the Arboretum's Wilcox footbridge: "affluent effluent."

For nearly 20 years, he has worked in the Arboretum: first as the manager of the plant collections here for the University of Washington, and more recently working with volunteers and doing outreach and fundraising for our Foundation. His love for the Arboretum and his knowledge of its trees and shrubs just shines. I have teasingly said to many old-timers that he knows the Arboretum better than anyone alive. No one has yet challenged my claim.

But, Randall's true gift and calling is teaching. His is the very rare combination of deep knowledge and attention to detail, passion for his subject, and an impish sense of fun. He loves to share what he knows with others, and to inspire them.

Over the past year he has been talking with me about his future plans. This winter he reduced his time with us, so he could begin teaching plant identification at South Seattle College. Updating the course material and making it his own has been exhausting work, but he clearly loves it and wants to do more. He also began an ambitious project to plant a world-class mahonia collection in the college's campus arboretum.

So, he is being pulled elsewhere—and he is leaving our staff. All of us want him to stay connected to the Foundation and the Arboretum, and we will be happy to have him on a contract to organize the Walks and Talks programs for our Arbor Circle members and for other special projects.

I am so grateful for his contribution to the Arboretum over all of these years, and for his support for me and his collaboration with our team. Not having him here in the office will leave a void. Who will answer those questions, guide those memorable tours? Who will lighten our day with gentle, playful wit? He is irreplaceable. That is why he is our one-name icon. We wish you the very best, indeed, Randall.

Cheers,

Paige Miller

Paige Miller, Executive Director, Arboretum Foundation

Nurseries *to* Visit *on the* Olympic Peninsula

By Janine Anderson

The Olympic Peninsula has numerous attractions, and summer is the best time to visit. The million-acre Olympic National Park has miles of wilderness coast, endless trails through scenic wonders, and a majestic rainforest. Among the peninsula's many other treasures are the Victorian seaport of Port Townsend; the ferry crossing the Strait of Juan de Fuca from Port Angeles to Victoria, BC; and Cape Flattery at the northwestern-most point in the continental United States. For gardeners on the go, three specialty nurseries stand out as destinations all on their own. Far Reaches Farm, Chimacum Woods and The Desert Northwest are worth the time and effort to visit—not just for the amazing plants they offer, but also for the creative individuals who nurture them.

Far Reaches Farm

Located on six bucolic acres just 10 minutes from downtown Port Townsend, Far Reaches Farm isn't really a farm. Opened in 2005 by Kelly Dodson and Sue Milliken, Far Reaches Farm is a regional treasure, as well as a specialty nursery.

The story of Far Reaches Farm. Before starting their nursery, Kelly and Sue had already been plant purveyors for decades; Kelly previously owned Reflective Gardens in Poulsbo, Washington, while Sue had a nursery in Vermont. The seeds for their current joint endeavor were

TOP: Brazilian native *Alstroemeria isabellana* flowers in July and August. (Photo by ar Reaches Farm)
INSET: Sue Milliken and Kelly Dodson of Far Reaches Farm. (Photo by Janine Anderson)

sown in 1997, when they met on a seed-collecting expedition to China.

Both have had lifelong passions for plants. Kelly grew up in Puyallup—where his parents built a greenhouse for his cactus collection when he was just 11 years old—and he majored in horticulture at Washington State University, while Sue earned a biology degree from Middlebury College in Vermont.

Most of the plants Kelly and Sue offer are propagated at the farm. Nothing harmful is employed in plant production. Organic or biological methods are used for insect and disease control. Weeding is done by hand, and hazelnut shells are used for mulching and weed suppression. The nursery's custom potting soil mix contains no peat moss, owing to the unsustainable nature of peat moss harvesting. Slow-release fertilizer is used to minimize nutrient leaching. Kelly and Sue's thoughtful practices are good for the plants, but also for the surrounding ecosystem. A large wetland on the property is home to frogs, salamanders and newts, as well as ducks, herons, songbirds and rails (small, shy wading birds), and Kelly and Sue want to prevent chemicals from reaching the wetland.

The populations of birds and bees have increased since Kelly and Sue opened the nursery: Brewer's blackbirds nest in potted plants, and Anna's hummingbirds spend winter nights in the greenhouse among the most nectar-producing flowers. Killdeer lay eggs on a garden berm just a few feet from the entry drive. These reliable returnees have halted the expansion of an entry garden. Here, a dramatic assemblage of xeric plants, anchored by large boulders and two stately *Yucca rostrata*, is followed by a long strip of uncultivated soil, where the killdeer nest and raise several clutches throughout spring and summer.

The plants. Far Reaches Farm offers unusual plants from around the globe that often cannot be found at conventional retail nurseries. Many of its offerings are grown from seed collected during Kelly and Sue's multiple expeditions to China and the adjacent Sino-Himalaya area. Among the mouth-watering temptations you might encounter on a summer visit are nine varieties of *Agapanthus*; six different types of manzanita (*Arctostaphylos*), including several that can be used as groundcovers; six species of red hot poker (*Kniphofia*); some knockout Peruvian lilies (*Alstroemeria*); various types of giant Himalayan lily (*Cardiocrinum*); and 30-some varieties of *Crocosmia*. Many of the plants offered for sale are displayed in the nursery's shade house or in one of its jaw-dropping borders. Be forewarned that visiting Far Reaches Farm can be a little heart wrenching because many of the most sought-after plants sell out soon after they become available.

The details. Far Reaches Farm sells plants via its online catalog. Plants are also available at the nursery, which is open from spring into fall—from 10 a.m. to 4 p.m., Thursday through Saturday. Plants ordered online can be picked up year-round by appointment between 10 a.m. and 3 p.m. on weekdays. More information, including dates and locations of off-site plant sales, can be found on the nursery's website, farreachesfarm.com.

Chimacum Woods

If you're heading west to the Olympic Peninsula from the Kingston or Bainbridge Island ferries, take a left, just a few miles after crossing the Hood Canal Bridge, to wend your way to rhododendron nursery Chimacum Woods. Shrouded in a forest setting about four miles south of State Route 104, the nine-acre nursery is owned by Bob Zimmermann and Beth Orling.

The story of Chimacum Woods. The nursery was started by Bob in 1976, and Beth joined the business after their marriage in 2001. Bob and

Nesting killdeer (here, an adult is sheltering four chicks) prevent expansion of entry garden at Far Reaches Farm. (Photo by David Gluckman)

Beth met in grade school and stayed in touch through college, then lost contact for 38 years. Neither had strong horticultural roots; Bob was an English major in college, while Beth majored in German.

When Bob bought his first house during graduate school, he also acquired his first rhody, (a hybrid named 'Elizabeth') and recalled that his father had grown rhododendrons in New Jersey. After that, he had purchased a "Sunset" book on rhododendrons, the last chapter of which was on propagation. Bob took a cutting from a rhododendron growing at the local library, turned a pie tin upside down over the pilot light on his gas stove, and put the cutting in a pot covered with a plastic bag. (The book said that bottom heat and high humidity were recommended for propagating rhodies.) He was careful to move the pot every time he used the stove. The cutting rooted (it turned out to be *Rhododendron* 'Fragrantissimum'), and Bob's passion for the genus was ignited.

Bob says his formal education in horticulture was by trial and error in the school of hard knocks—with an emphasis on error, reportedly having made every mistake in the book. He says he's still learning and has two large piles of dumped substrate from dead plants at the nursery to prove it.

The turning point for Chimacum Woods was in 1982, when China eased travel restrictions and Bob began to get wild-collected rhododendron seed. Since then, Chimacum Woods has focused

TOP: The long, narrow, lanceolate leaves and pink-white flowers of *Rhododendron makinoi*—for sale at Chimacum Woods. (Photo by Steve Law/Wikimedia Commons)

CENTER: Beth Orling and Bob Zimmermann of Chimacum Woods with *Rhododendron luteum*, which was grown from wild-collected seed from Turkey. (Photo by Chimacum Woods)

BOTTOM: Fragrant white flowers of summer-flowerin *Rhododendron auriculatum* at Chimacum Woods. (Photo by Chimacum Woods)

almost exclusively on species plants grown from seed, either wild collected or carefully hand pollinated. From the seed cups, the plants go into two-inch bands, then four-inch pots, then one-gallon containers—and finally into two-gallon containers to grow out their roots for sale the following year. The entire process takes five to six years. For Bob and Beth, species rhododendrons are about foliage, and flowers are just a bonus.

Bob has been on numerous seed-hunting expeditions. In 1997, he explored southwest Tibet with rhododendron specialist Kenneth Cox of Glendoick Gardens in Perth, Scotland. They were the first westerners to visit the area in 50 years and brought back *Rhododendron lanatoides*, a species new to cultivation in the West. Subsequent trips included ones to Yunnan Province in 2000 and 2001, and another to Sichuan Province in 2009. He also led his own trips in 2013 and 2015. Bob says the trips, for him, are about one-third botanical, one-third cultural (they are always based in tribal areas), one-third political (he was arrested in Tibet), and one-third spiritual. (Because his days start at 6 a.m. and end at midnight, he claims there are enough hours in one day for an extra third!) On his best day, Bob saw 43 different species of rhododendrons. His longest hike, in 2000, was 20 miles in one day, with 6500 feet of elevation change; the second longest was in 2015, with 16 miles and 5200 feet of elevation change.

The plants. You can purchase rhododendrons at Chimacum Woods, and you can also stroll paths through an extensive display garden. In summer, the garden is a study in what species rhododendrons look like year round—with striking leaves that don't need flowers to be appealing and elegant shapes that transcend the stereotypical rounded balls of many plants in the trade—not to mention the unattractive, leggy shapes that many rhodys assume once they have outgrown their sites.

Chimacum Woods is a working garden and experimentation is ongoing. Rhododendrons can be found in hanging baskets. (Some of them, after all, are epiphytes.) There are also some species that bloom in July, August or September. Most of these have white flowers, and all are fragrant. *Rhododendron auriculatum* is a good example. Bob and Beth are always in propagation mode—growing seeds, transplanting, making cuttings, etc.—and they are enthusiastic about sharing their knowledge.

The details. Visitors to Chimacum Woods are always welcome by appointment. Along with extensive plant descriptions and photos, the

TOP: Hoophouse at The Desert Northwest contains a treasure trove of exotic species. (Photo by The Desert Northwest)

INSET: Ian Barclay of The Desert Northwest in Sequim. (Photo by The Desert Northwest)

OPPOSITE PAGE: Winter flowers of *Grevillea victoriae* 'Murray Valley Queen'. (Photo by Janine Anderson)

nursery's website (chimacumwoods.com) lists weekends when the nursery is open to the public; Puget Sound garden centers that carry its plants; and also dates and locations of local plant sales, where plants from the nursery are featured.

The Desert Northwest

Located in Sequim, Washington—just south of Highway 101—The Desert Northwest is owned by Ian Barclay and specializes in drought-tolerant and rare plants.

The story of The Desert Northwest. Ian's interest in plants developed while in high school in Olympia, Washington. He joined the school's horticulture club and quickly filled a hobby greenhouse with rare and unusual plants collected at specialty nurseries. As a senior, Ian took horticulture as an elective, but most of his learning was hands-on at home.

Ian entered Washington State University as a music major but ended up with a degree in ornamental horticulture. Despite his credentials, most of what he knows came about through trial and error and experimentation. Because he experimented at his parents' property while in college, he developed an interest in plants that would require very little care during the months that he was away. What survived were generally plants that were watered only once after planting. *Eucalyptus* and other Australian plants thrived. At one time, Ian had over 100 species of *Eucalyptus.* About 20 to 25 of these survived the hard winters of 2008 to 2010.

Ian still likes *Eucalyptus*, although he no longer offers many for sale. He's partial to plants from Australia, New Zealand, Chile, South Africa, California, the American Southwest, the Mediterranean region and, to some extent, Mexico. He's not particularly smitten with thirsty Asiatic flora, but—of course—there are exceptions. His favorite genera include *Grevillea, Eucalyptus, Olearia, Leptospermum, Opuntia, Agave, Arctostaphylos, Quercus* (especially the evergreen oaks), *Podocarpus and Delosperma.* Ian went through a bamboo phase and, at one point, had about 100 different kinds of bamboo. He is now down to 60 or so and has decided to continue to maintain them only as a hobby because they don't fit the water-wise theme of the nursery.

The plants. The Desert Northwest sells plants from each of Ian's favorite genera. For example, there's New Zealand native *Olearia ilicifolia*, which has dark stems and crinkly, gray, holly-like leaves; the Australian native *Leptospermum lanigerum*, which has small leaves that are aromatic when bruised; and at least seven varieties of *Grevillea victoriae* (royal grevillea) —including 'Murray Valley Queen', which, at four-by-four feet, is somewhat more compact than the straight species. Most of Ian's plants are available by mail order. Plants in pots larger than one gallon must be picked up at the nursery. Ian also delivers plants throughout the region for a fee and/or minimum order.

The details. Information about dates the nursery is open for visitors, along with plant sales in which Ian is participating, can be found on Ian's blog (desertnw.wordpress.com).

Conclusion

Far Reaches Farm, Chimacum Woods and The Desert Northwest are three fascinating destinations for gardeners visiting the Olympic Peninsula during the summer. Each nursery offers unique and exotic plants from around the globe. The vast knowledge of their impassioned creators is shared enthusiastically with visitors, and you will return home all the richer for having visited them.

Janine Anderson, CPH, is an award-winning Pacific Northwest-based landscape designer (www.anderson-design.net), garden writer, speaker, and member of the "Bulletin" Editorial Board.

Rosa x cantabrigiensis 'Red Wing' blooming in Crabapple Meadow in June.

Hidden Treasures of the Arboretum

Rosa × cantabrigiensis 'Red Wing'

TEXT AND PHOTOS BY DANIEL MOUNT

You may not think of the Arboretum—with its mossy groves of conifers—as a good place to seek out roses, but you'd be mistaken. The University of Washington's collection features more than 150 individual plants, representing 30 species, and an additional 35 cultivars and hybrids. A large number of these roses are growing in the Arboretum proper and arrived here between 1947 and 1960, under the auspices of then-director Brian Mulligan. One, in particular, stands out for its year-round interest: *Rosa × cantabrigiensis* 'Red Wing'.

Rosa × cantabrigiensis was a chance seedling found in the Cambridge University Botanic Garden in the late 1920s by rose geneticist

Charles Chamberlain Hurst. Hurst worked there from 1922 to 1947, trying to disentangle the complicated genetics of garden roses, and he created a few beautiful hybrids himself. *Rosa* × *cantabrigiensis* is the best-known and most widely used of his Cambridge roses. It was awarded the Royal Horticultural Society's Award of Garden Merit in 1994.

A cross between *Rosa hugonis*, the golden rose of China, and *R. sericea*, the silky rose, it possesses the lovely fern-like foliage of both parent species. Its single, large, gently fragrant flowers are a primrose yellow—somewhere between the white of *R. sericea* and the golden yellow of *R. hugonis*. They appear as early as mid-May and are followed by handsome orange-red hips in late summer.

Two specimens of this rose grow in the Arboretum on the southeast side of Crabapple Meadow. Growing with them is a cultivar of mysterious origin called 'Red Wing'. The winged, fiery-red thorns on the new canes—an attribute inherited from the silky rose—make this rose stand out from the straight *Rosa* × *cantabrigiensis*.

The Arboretum received five six-inch plants of *R.* × *cantabrigiensis* 'Red Wing' from the Arnold Arboretum in October of 1958. They were grown in the nursery for a decade before being planted out in the Arboretum. One specimen, which was planted along the road to Foster Island, was lost to the construction of the Evergreen Point Bridge in the early 1960s; another nearby specimen failed to establish and succumbed to drought.

According to UW Botanic Gardens Curator of Living Collections Ray Larson, two specimens were planted in the old Rose section north of the Arboretum, in beds facing Lake Washington Boulevard. But these beds were destroyed, along with many others in the late 1960s, during the construction of the RH Thompson ramps. The records say that, prior to the construction, one of the plants was moved back to the nursery (which back then included all of current-day Crabapple Meadow), and the other was planted in the lath house (remnants of which can still be seen behind the Big Greenhouse). It's unclear what happened to these plants since.

But we do know that one still thrives along the service road that runs south from the Graham Visitor Center along the Broadmoor fence. It was planted there in 1967, when it was only four-and-a-half-feet tall. It is now a dense stand of old and new canes 10 feet wide and tall. When in bloom, it's covered with a mass of lovely yellow flowers.

If you wander down the service road past the greenhouse and the beehives, you will soon reach the crabapple collection, where you'll find numerous large roses. Continue on the road until you're almost beyond the meadow, and you won't be able to miss the large red thorns of *R.* × *cantabrigiensis* 'Red Wing'.

Daniel Mount is an estate gardener, garden writer and member of the "Bulletin" Editorial Board. He lives on a small farm in the Snoqualmie Valley. Read more of his reflections on plants and gardening at www.mountgardens.com.

Blue orchard mason, *Osmia lignaria*. (Photo by USGS Bee Inventory and Monitoring Lab/ Wikimedia Commons)

Getting *to* Know Our Native Bees

By Hillary Sardiñas

With summer here, gardens are buzzing with pollinators—and not only the honey bees. The European honey bee is just one of more than 20,000 bee species worldwide. Honey bees, brought to America by settlers, only reached the West Coast in the 1860s. Before that wild, unmanaged bees provided most of the pollination of wildflowers and crops. Native bees are still the most important pollinators of wild plants, helping to maintain ecosystem diversity. In addition, bees help feed the world: One out of every three bites of food we eat needs a pollinator to reproduce. Native bees play a large role in crop pollination, and they are often better pollinators than honey bees, spending more time on each flower and therefore helping to transfer more pollen.

Most bee diversity is concentrated in Mediterranean environments, however the Pacific Northwest also hosts numerous species. The vast majority of bees are solitary, meaning they don't form complex colonies with divisions of labor, like honey bees. Although social bumble bees nest in cavities, solitary wild bees either excavate nests in the ground, or find hollow stems to occupy. The rainy environment in the Pacific Northwest makes the latter nesting strategy much more attractive, as plant stems are less likely than soil to get inundated. Because most native bees are solitary, they don't have a hive to protect and are therefore much less likely to sting than honey bees. In fact, you really have to get a native bee mad to provoke it into stinging you.

Causes of Bee Decline

Unfortunately, both native bees and honey bees are currently declining due to a number of threats. Habitat loss is one of the major drivers of biodiversity loss worldwide. Even remnant habitat fragments are losing value due to the spread of invasive plants. The invasives compete with the native plant species most wild bees rely on for pollen and nectar. Disease spread is another major issue facing bee populations. Managed

bees, like bumble bees used for tomato pollination, spread disease to native bumble bees. Many bumble bee species that were once widespread have disappeared throughout most of their range. The western bumble bee *Bombus occidentalis* used to be the most common species west of the Mississippi, but is now rarely seen. Another species with a more limited range, Franklin's bumble bee *Bombus franklinii*, hasn't been recorded since 2006, despite extensive searches in its former Southern Oregon range.

How You Can Help

You can help with bee conservation by planting flowering plants in your yard for continuous, year-round bloom. Focus on native species because ornamental plants, while showy, often no longer produce the pollen and nectar bees rely on. Bees also need nest sites, either undisturbed bare soil or pithy-stemmed plants (like raspberries). See the "Native Plants for Native Bees" on page 13 for some recommendations. More extensive plant lists for regional pollinators, as well as recommended nurseries and other resources, can be found at: www.xerces.org/pollinators-pacific-northwest-region/.

Make sure that the plants you purchase weren't treated with systemic pesticides like neonicotinoids. Systemic pesticides can be expressed in pollen and nectar, making them toxic to bees. In addition, it is important to avoid spraying any blooming plants with pesticides or herbicides, as these can be harmful to bees and other pollinating insects like syrphid flies.

Learn more by exploring www.xerces.org/pollinator-conservation/.

Major Bee Groups in the Pacific Northwes

Of course, when you're trying to contribute to a conservation effort, it can help to know a little bit about what it is you're trying to conserve. Below are profiles of some of the major bee groups in our region. Next time you're out in your garden, see how many of these groups you can identify.

Bumble Bees (*Bombus*)

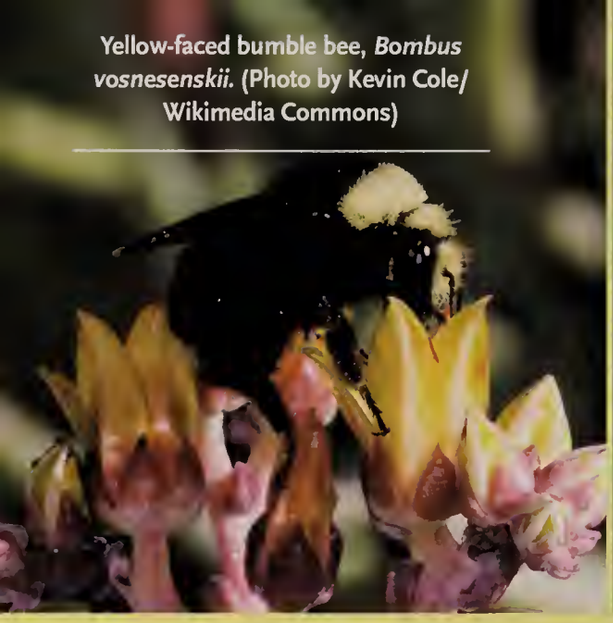
Life History: Bumble bees are some of the most important pollinators. They are active from early spring, when queens first emerge and search for food to start their colony, until late fall. Bumble bees have the ability to buzz pollinate, or vibrate a flower at a frequency that causes pollen otherwise locked within a flower to explode onto the bee. Bees that can't buzz pollinate are ineffective pollinators of plants that require it, such

The Xerces Society *for* Invertebrate Conservation

Robert Michael Pyle started the Xerces Society in 1971 to raise awareness about invertebrate conservation. Named after the extinct Xerces Blue butterfly, which used to live on the sand dunes of San Francisco, the Xerces Society continues to educate and advocate for critically important but often unseen species.

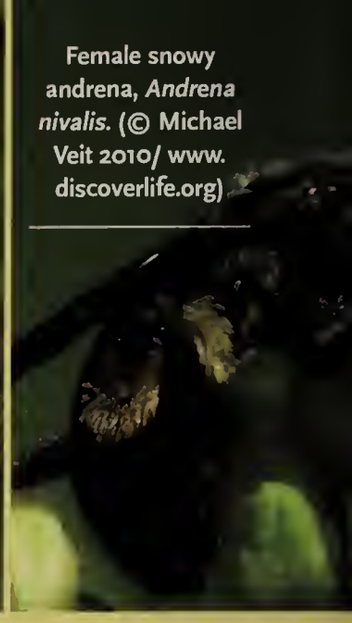
On-Farm Conservation: The Xerces Society's Pollinator Program has worked with farmers across the U.S. to create on-farm, flower-rich habitats. It has supported the creation of more than 250,000 acres of pollinator meadows and hedgerows. These areas not only support crop pollinators, but also provide habitat to natural enemies of crop pests. The Pollinator Program has offered trainings, field days and short courses to farmers in all 50 states. On-farm habitat benefits both pollinators and farmers, who see increased crop pollination and yields.

Endangered Species Conservation: The Xerces Society also works to monitor populations of imperiled pollinators. Project Bumble Bee combines science and advocacy to engage citizens, landowners and government agencies in the protection of declining bumble bee species. You, too, can get involved in efforts to track bumble bee species by joining Bumble Bee Watch, a citizen science initiative that helps researchers track species remotely. You can upload photos of bumble bees that will be identified by an expert at www.bumblebeewatch.org/.



Yellow-faced bumble bee, *Bombus vosnesenskii*. (Photo by Kevin Cole/ Wikimedia Commons)

Sweat bee, *Halictus tripartitus*. (© John Ascher 2006/ www.discoverlife.org)



Female snowy andrena, *Andrena nivalis*. (© Michael Veit 2010/ www.discoverlife.org)

as tomatoes. Bumble bees are also generalists, meaning that they visit a number of different plant species instead of focusing on one or a few. They also have large ranges, enabling them to pollinate plants over great distances. Bumble bees are keystone species in many ecosystems—meaning that a lot of other species in these systems depend on them.

Description: Bumble bees are easy to identify, with their large, fuzzy bodies and iconic black and yellow banding. Some species of bumble bee have white or orange markings as well. Like honey bees, bumble bees carry moistened balls of pollen on their hind legs.

Common PNW species: Black tail bumble bee, *Bombus melanopygus*; fuzzy-horned bumble bee, *Bombus mixtus*; yellow-faced bumble bee, *Bombus vosnesenskii*; California bumble bee, *Bombus californica*.

Sweat Bees (*Lasioglossum* and *Halictus*)

Life History: Sweat bees got their name because some species collect salt from animal sweat, including from humans. Sweat bees are small and dark; they don't have the typically black and yellow coloring we associate with bees. For these reasons, sweat bees are often confused with flies. Because they are so small, they pollinate by climbing deep into flowers and spending a lot of time drinking nectar and collecting pollen. They are quasi-social, with mothers and daughters living together but not splitting labor or suppressing one another's reproduction. (In short, there's no queen.) They are often one of the most common bee species in urban and agricultural environments.

Description: Sweat bees are usually black or dark-metallic grey. Some species have pale, hairy strips on their abdomen. They carry dry pollen on their hind legs.

Common PNW species: small sweat bee, *Halictus tripartitus*; medium sweat bee, *Halictus ligatus*; tiny sweat bee, *Lasioglossum* species.

Mining Bees (*Andrena*)

Life History: Mining bees excavate nests underground, hence the common name. They are one of the main blueberry pollinators besides bumble bees, often nesting at the base of blueberry plants. (One native species, *Andrena astragali*, is a specialist pollinator of the death camas—*Zigadenus* species—and has the unfortunate name death camas bee.) They also have been known to nest in lawns. Mining bees are solitary, with one female creating a few nests during her lifetime, which often lasts just four to eight weeks. Each nest in the dirt contains approximately five cells, or chambers, provisioned with enough pollen for a single bee larvae. The female bee lays one egg per cell, then caps the cell with mud; she never sees her offspring. After an egg hatches, the larva consumes all the pollen, then metamorphoses into an adult bee. It spends the rest of the year and winter in diapause (a period of suspended development) underground, waiting for the right seasonal cues (temperature and moisture), which let it know that it's time to emerge to pollinate and reproduce.

Male western leafcutter bee, *Megachile perihirta*. (© Celeste Ets-Hokin 2013/ www.discoverlife.org)

Description: Mining bees often have fuzzy orange or blond thoraxes (midsections) and dark abdomens with light stripes. They carry their pollen dry on their hind legs, which makes them look like they are wearing chaps.

Common PNW species: Death camas bee, *Andrena astragali*; snowy adrena, *Andrena nivalis; Andrena evoluta*.

Leafcutter Bees (*Megachile*)

Life History: Leafcutter bees are aptly named: They cut sections of leaves or petals to create cell divisions within their nests. Leafcutter bees have large mandibles (oral appendages used for cutting) and wide heads to help with their task of snipping pieces of plant. Leafcutter bees nest aboveground in holes in wood. Because of the tight nesting space, instead of carrying pollen on their legs, they carry it under their abdomen. Another name for leafcutter bees is "hairy-belly bees," which refers to the specialized hairs, or "scopa," on their underside. When they forage on flowers, leafcutter bees often lift their abdomen up, preventing it from wiping the pollen away on the flower. This posture distinguishes them from other bee species. Though leafcutters can cause superficial damage to some plants in the garden, they more than make up for it by being productive summer pollinators. (If they are targeting a prized rose or other plant, you can protect it temporarily with row cover cloth until the bees find something new to take pieces from.)

Description: Leafcutter bees are often more squat-looking than other bee species. They carry their pollen under their abdomens, which are usually black with pale bands of hair.

Common PNW species: western leafcutter bee, *Megachile perihirta*; silver-tailed petal-cutter beer, *Megachile montivaga*.

Mason Bees (*Osmia*)

Life History: Mason bees are named for the way they use mud as a building material to create cell divisions in their nests. Providing access to mud can help support populations of wild mason bees. Mason bees are solitary, and they make

Native Plants *for* Native Bees

Here are some handsome Northwest native plants—listed in order of bloom time—that provide good food and habitat for native bees. For more suggestions, visit www.xerces.org/pollinators-pacific-northwest-region/.

Perennials

- Bigleaf lupine (*Lupinus polyphyllus*)
- Slender clarkia (*Clarkia gracilis*)
- Selfheal (*Prunella vulgaris* ssp. *lanceolata*)
- Canada goldenrod (*Solidago canadensis*)
- Hall's aster (*Symphytotrichum hallii*)

Shrubs

- Oregon grape (*Mahonia aquifolium*)
- Blueblossom (*Ceanothus thyrsifloru*)
- Cascara (*Rhamnus purshiana*)
- Nootka rose (*Rosa nutkana*)
- Salal (*Gaultheria shallon*)
- Oceanspray (*Holodiscus discolor*)
- Coyotebrush (*Baccharis pilularis*)

their nests in naturally occurring, aboveground cavities. They mate in spring, after which the female bees collect nectar and pollen provisions for their nests. Each female then finds a hole or tunnel in which to create a compartmentalized nest for her eggs. With the eggs fully provisioned, the female then plugs up the entrance. The larvae hatch, feed, hibernate through winter in cocoons, and emerge in spring to start the cycle afresh. Mason bees are very efficient pollinators and are active from spring through late summer. Commercial mason bees are sold for pollination purposes, but these bees can potentially harm wild, locally native mason bees (see "Downside to the Mason Bee Trade").

Description: Mason bees often have exoskeletons with metallic coloration ranging from green to teal. They have a narrower body than leafcutter bees, though they also carry pollen under their abdomens.

Common PNW species: blue orchard mason, *Osmia lignaria; Osmia brevis; Osmia occidentalis; Osmia pusilla.*

Cuckoo Bees (*Sphecodes, Nomada, Triepeolus* and *Coelioxys*)

Life History: Cuckoo bees get their name from cuckoo birds because they also are parasitic: Instead of creating their own nests, cuckoo bees lay eggs in the nests of other bees! When cuckoo bee larvae hatch from their eggs, they are able to move, and then search out and destroy the larvae of their host. Because cuckoo bees don't need to collect pollen to provision nests for their young, they are often less hairy in appearance. Cuckoo bees are intimately connected to their host species, so that if host populations decline, cuckoo bees will likely also suffer.

A male concave cuckoo bee (*Triepeolus concavus*) on a blanket flower. (Photo by Kathy Keatley Garvey/UC Davis "Bug Squad" blog, http://ucanr.edu/blogs/bugsquad/index.cfm.)

Description: Cuckoo bees are often red or yellow, and sometimes have white marking. They are often nearly hairless, and so can have a wasp-like appearance.

Common PNW species: concave cuckoo bee, *Triepeolus concavus.*

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Downside *to the* Mason Bee Trade

Keeping mason bees for pollination in gardens and farms is increasingly popular as they are readily available from suppliers. The trade in mason bees, however, is leading to the spread of species outside their native ranges, which can create competition with native species. Although some mason bees, such as the blue orchard mason bee (*Osmia lignaria*), have large ranges, populations of individual species have local adaptations that help them survive in specific areas. The Xerces Society for Invertebrate Conservation recommends first creating habitat that supports local populations of wild bees by supplying lots of floral bloom throughout the year. If you do choose to buy mason bees, consider purchasing them from your area and never using species that are not locally native, including *Osmia rufa* which is native to Europe.

While more research into the possible negative effects of non-native mason bees is required, taking precautions will help minimize potential future problems that could arise. If creating artificial nests for mason bees, such as bee hotels (straws of holes drilled in wood), be aware that these types of bee houses can build up parasites over time. It is important to sanitize or burn nests every three to five years to avoid disease and parasite build-up that might harm wild mason bee populations.

Climate Change: Another Potential Threat *to* Native Bees

By Janet Marinelli

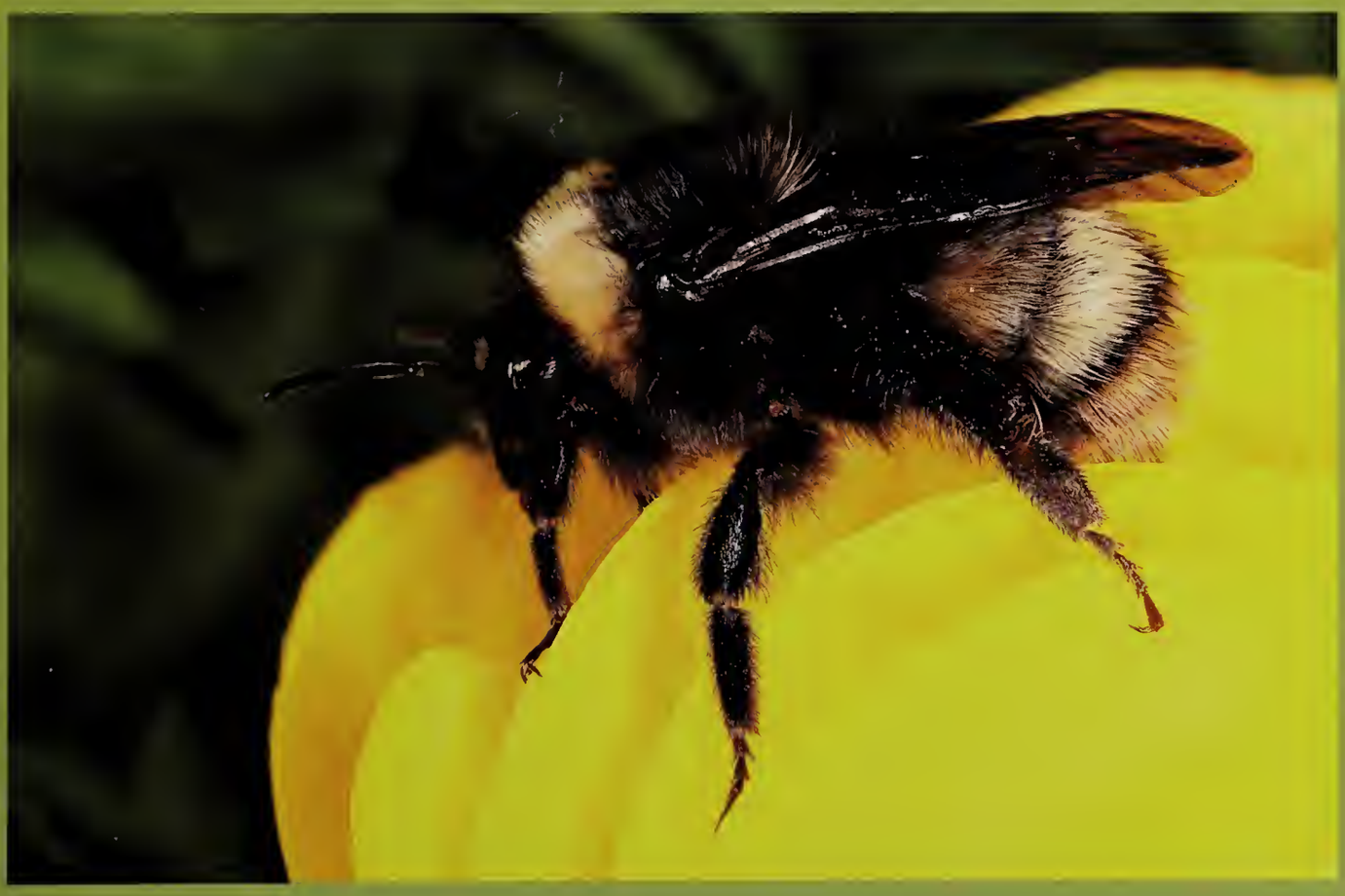
Bees just can't catch a break. In recent decades not only European honey bees but native species have been walloped by pests and diseases, habitat loss and fragmentation, as well as cocktails of toxic pesticides. Now, new research is showing that climate change may also present challenges to these crucial pollinators.

"We don't know how this story will play out," says Xerces Society Senior Conservation Scientist Rich Hatfield about the effects of changing temperatures, precipitation patterns, and bloom times on native bees—subjects that have been explored in a dozen papers published during the past few years. Bees and their flower partners have evolved complex and often synchronized interactions with the environment and each other, and predicting whether or precisely how rapidly changing climatic conditions will effect them is difficult. What's more, knowledge about most bee species is exceedingly sparse, despite their importance to both wildflowers and food crops.

The Plight of the Bumble Bee

Much of the scant research on native species has focused on the bumble bee, in large part because the plus-size pollinator is easy to identify. The lovable, buzzing bear of a bee is built like a Mack truck to carry a lot of cargo, and its distinctive fur coat is tailor-made for attracting pollen. It surpasses even the celebrated honey bee in the industriousness department: Bumble bees are often up and out of the hive before dawn, way

Bumble bees—like the once-common western bumble bee (*Bombus occidentalis*)—are declining rapidly, due, in part, to climate change. (Photo by the USDA Agricultural Research Service/Wikimedia Commons)



before the honey bees, and they're frequently still hard at work after the sun has set. What's more, the nearly 50 bumble bee species in North America visit a wide array of flowering plants and have a long flight season, making them "an essential part of the continent's pollinator communities," in the words of a Xerces Society publication on bumble bee conservation (see "References").

A lot of attention has been paid to the plight of the honey bee, but much less appreciated and understood is the decline of bumble bees. Several North American species are declining dramatically, including the once-common western bumble bee (*Bombus occidentalis*), which used to range throughout the western U.S. and Canada, and Franklin's bumble bee (*Bombus franklini*), which is endemic to Oregon and Northern California and may already be on the brink of extinction. Although studies are few, and their conclusions more predictive than definitive, the decline of some bumble bee species can be attributed at least in part to climate change.

According to one study of dozens of species in Europe and North America published last year in the journal "Science," bumble bee ranges appear to be contracting. Unlike birds and other animals, which seem to be keeping pace with rapidly changing conditions, bumble bees are failing to "track" warming by colonizing new habitats to the north. At the same time, they're disappearing from the southern portions of their historic ranges.

Phenological Problems—An Issue of Timing

Although many bee and plant relationships have a long evolutionary history that survived natural climate shifts in the past, scientists worry that the age-old synchronicity of bloom time and bee emergence from winter hibernation may be lost due to the speed of the current climate convulsion. What little research has been done has produced mixed results. In a 2011 paper, published in the "Proceedings of the National Academy of Sciences," scientists found that over the past 130 years the emergence of 10 bee species native to the Northeast, including two bumble bees, has kept pace with advances in the flowering time of bee-pollinated plants. It's interesting to note that all 10 species are generalists, which aren't fussy about the flowers they visit—as opposed to specialists, which have evolved a specific relationship with a few or even just one plant species.

In contrast, two years ago, British scientists—using museum records stretching back to 1848—determined that the European early spider orchid (*Ophrys sphegodes*), and the miner bee (*Andrena nigroaenea*) on which it depends for reproduction, have become increasingly

ABOVE: *Bombus sylvicola* is one of two alpine bumble bees in Colorado that are evolving from specialist to generalist feeders in response to climate change-related decreases in midsummer flowers. (© John Ascher 2006/ww .discoverlife.org)

out of sync as spring temperatures rise due to global warming. The wily orchid, which looks a lot like a female bee, tricks smitten males into performing "pseudocopulation," thereby fertilizing the flowers. "Our results demonstrate a significant potential for coevolved plant-pollinator relationships to be disrupted by climatic warming," the researchers concluded.

Fewer Summer Flowers

Biologists, who studied a montane meadow ecosystem in the southern Rocky Mountains, detected another climate-related floral aberration. They found that as mid-summer temperatures warmed from 1974 to 2009, there was a reduction in mid-season flower abundance. This lull in flower activity, they suspect, could have a negative effect on pollinators—such as bumble bees and hummingbirds—that are active throughout the season and require a continuous supply of blooms.

In still another another warming-induced oddity, scientists reported last year that during the past four decades the proboscides of two long-tongued alpine bumble bee species in Colorado have shrunk by nearly 25 percent—despite the fact that the flowers on which they forage have not become shorter, and small-flowered plants have not become more prolific. The researchers noted that warmer and drier summers have caused an overall decrease in flower availability, and they suspect that as the abundance of long-tubed flowers has declined, their flower specialists have been forced to become more generalist foragers to survive. Although this suggests that the bees are adapting rapidly to changing conditions, such modifications to bee morphology are likely to have a less salubrious effect on their former plant partners.

Specialist Pollinators at Highest Risk

Several recent papers appear to confirm fears that climate disruption probably will have the direst effects on pollination specialists. A 2010 study of how two major drivers of environmental change interact to affect plant-pollinator interactions, for instance, led European biologists to conclude that both climate change and introduced non-native species will ultimately promote the creation of novel ecological communities, in which some biological interactions may be lost but new ones potentially will emerge. "What can be expected, though," they wrote, "is that generalist species are more likely to profit while specialists will rather not."

One of the main causes of climate change—rising carbon dioxide levels—may cause problems for bees of all stripes. Using herbarium specimens dating back to 1842, researchers at the Smithsonian recently found that rising temperatures have reduced the protein content of goldenrod pollen—a key late-season food source for bees—by 30 percent. Many studies have shown that elevated carbon dioxide makes plants starchier and less protein-rich. Bees don't appear to adjust their intake of food based on its nutritional inferiority, and a decline in nutrition can directly affect bee behavior, health and lifespan.

For now, problems such as pesticides and pests are taking the greatest toll on native bees, says the Xerces Society's Hatfield. However, climate change is likely to add increasingly to the pressures they already face. Citizen scientists, Hatfield says, can help secure their future by filling the knowledge gap on native bees. The Xerces Society launched a project called Bumble Bee Watch to learn more about these important pollinators. For details, see bumblebeewatch.org.

Janet Marinelli is an award-winning independent journalist who was director of scientific and popular publications at Brooklyn Botanic Garden for 16 years. She has written and edited several books on imperiled species and the efforts to save them. Her articles have appeared in a variety of publications, from "The New York Times" to "Audubon" and "environment360."

References

"Conserving Bumble Bees: Guidelines for Creating and Managing Habitat for America's Declining Pollinators." Rich Hatfield et al. The Xerces Society for Invertebrate Conservation (2012). Free download available at www.xerces.org/guidelines/.

Reluctant City—
A Brief Account of Environmental Design in Seattle
Part 2: Retrieving Nature's Outline

By Betsy Anderson

Seattle's urban fabric was indelibly shaped by its Progressive Era origins. In the late 19th and early 20th centuries, the city's topography, hydrology and transportation networks were redrawn to facilitate commerce and civic pride—as well as the health, and even the morality, of its citizens.[1] The great carving out of a city according to the logic of infrastructure—whether waterway, railroad, sewer line or boulevard—was a powerful gesture of urban design that would not be matched in the city for decades. In the meantime, the rest of Seattle's built environment was allowed to develop haphazardly, likened by one 1914 observer to "a tousled, unmade bed."[2]

Development was driven by expedience: Roads were routed from points A to B. Buildings were constructed according to need and based on pattern books or stock plans—especially in the earliest years, when professional architectural services could not be obtained locally. During its first half century of development, Seattle's designed spaces—both landscape and architecture—largely emulated the stylistic trends of the East.[3] The city seemed to have no need to assert a unique design identity.

To Better Fit a Way of Life

With few exceptions, little original design work was undertaken in the region until the

ABOVE: Richard Haag helped Seattleites see their gas plant in a new light. (Rendering by Richard Haag Associates, 1973; Seattle Municipal Archives, 76263)

OPPOSITE: The influence of Japanese architecture and the use of local materials, especially wood characterize the work of Northwest Modernists, including Paul Thiry, who completed the Brownell House in 1955. (University of Washington Libraries, Special Collections)

mid-20th century,[4] when a vanguard group of young architects put the Northwest on the map for the first time. This group, mostly native Northwesterners, had trained at the University of Washington under the architect Lionel Pries. They included the architects Paul Thiry, Paul Hayden Kirk, Wendell Lovett, Victor Steinbrueck, Fred Bassetti, Gene Zema, Ralph Anderson and Roland Terry, among others.

Their body of work—small in scale, sensitive to topography and aspect, expressive of structure, and reliant on abundant regional materials (especially wood)—came to be known as Northwest Modernism, or the Northwest School of Modernism.[5] Under the tutelage of Pries and the early leadership of Thiry, the Northwest School provided a distinctly regional answer to International Modernism that would shape design in Seattle for decades to come.

As Thiry described it, Northwest modernists sought to create:

> *...a building that would better fit a way of life, that would fit the land, exploit the vast panoramas of waterways and mountains that make the Northwest, that would enliven the gray days of winter and share the exterior country in summer: Buildings that would be flexible and adaptable to an infinite variety of situations: buildings that would shed the rain, take it away from the walls, yet permit the sun to infiltrate the interior.*[6]

In other words, these were designs that engaged both nature and function—buildings that aesthetically expressed Seattle's unique relationship to its environment. At last, here was a design idiom that could be considered distinctly regional. To practically adapt to the steep sites prevalent in the area, many of these buildings were constructed on piers in a post-and-beam style that echoed traditional Coast Salish longhouse construction techniques, as well as the Japanese architectural tradition, which had influenced several Northwest School practitioners—notably Thiry, Kirk and Zema.[7] The pier construction required less excavation on challenging slopes and also allowed water to run underneath the structure.

The regional fascination with function emerges in the clarity of structural expression that is found in these buildings. Here the pragmatism of construction informs the aesthetic: For example, the 6/12 roof pitch that is so prevalent in these buildings is optimal for removing rainwater.[8]

Significantly, Northwest Modernism was applied only to smaller-scale buildings—primarily residences, as well as smaller office buildings and churches. This reflected a continued regional ambivalence about urbanism. (See Part 1 of "Reluctant City" in the Spring 2016 "Bulletin" for a discussion of the origins of this ambivalence.) This urban reluctance is also illustrated by the deeply wooded, suburban sites typically selected for residential examples of the Northwest School. In communities such as Hilltop, just south of Bellevue, the success of the design was measured by how effectively the building was hidden in the second-growth forest.[9]

Projects in more urban settings include the UW Faculty Club, completed in 1960 and designed by Paul Hayden Kirk and Victor Steinbrueck. Considered one of the best examples of Northwest Modernism applied at the institutional scale,[10] it nevertheless relies on

organizing the building in residential-scale spaces devoted to diverse functions. Minimal ground disturbance was needed to construct the building's foundations, and most of the mature evergreen trees on the site were preserved.

The Magnolia Branch Library, also designed by Kirk and completed in 1964, is a particularly poetic expression of Northwest Modernism: The building also displays a reverence for residential-scale detail and is nestled in vegetation. Embracing a madrona tree extant on the site, Kirk's design emphasized wood with open beams and cedar siding. One of the library's first and youngest visitors is said to have quipped that the building was more appropriately a "tree library" than a "branch library."[11] Enormous windows made the space feel suspended in a surrounding native woodland garden, designed by landscape architect Richard Haag.

A City Comes of Age

Haag himself is a pivotal figure for Seattle design, having almost single-handedly facilitated the leap from a regional—but decidedly anti-urban—architectural approach to one that finally celebrated Seattle's civic and urban life. Haag arrived in Seattle in 1958, when hired by the University of Washington to start a new program in landscape architecture. The son of a Kentucky nurseryman, he had trained as a landscape architect and lived in Japan for two years, where he studied its vernacular landscapes as a Fulbright Fellow. In Seattle, Haag would maintain both an active practice and an enthusiastic teaching career, influencing the city's perception of its public space and inspiring a prominent new generation of landscape architects—including Grant Jones and Laurie Olin—who cut their teeth in his studios.[12]

Haag was the right person for the right job at the right time, as University of Washington Professor Thaïsa Way demonstrates in her recent monograph on Haag's work, "The Landscape Architecture of Richard Haag: From Modern Space to Urban Ecological Design." Haag's early exposure to botany and horticulture, and his extensive travels with mentors such as Stanley White and Hideo Sasaski, encouraged an interest in experimentation and an empirical approach to design that would support both his work and that of his students.[13] His first decades

TOP: Ralph Anderson's Ballard residence on Mercer Island, 1961. Anderson integrated both the exterior and interior of the house with mature conifers retained on the site. (University of Washington Libraries, Special Collections)

BOTTOM: The Magnolia Branch Library, designed by Paul Hayden Kirk, 1964. (Photo by Joe Mabel/Wikimedia Commons)

in Seattle were marked by a collective new interest in urbanism. For perhaps the first time, Seattle was embracing its identity as a city: This coincided with the environmental movement's shift in focus from wilderness to the city, as well as an increasing awareness of ecology and environmental justice issues.

Indeed, Seattle's urban activism in the early 1970s is considered instrumental in the birth of the urban environmental movement.[14] Grassroots efforts in urban preservation—for example, saving Pike Place Market and Pioneer Square through the establishment of historic districts—reflect a rising awareness of Seattle's existing urban fabric and a resistance of conventional urban renewal practices. This movement was largely led by designers, including Haag's colleagues and collaborators, the architects Fred Bassetti and Victor Steinbrueck. Investments in Seattle's civic spaces, including Haag's projects at Victor Steinbrueck Park and Gas Works Park, were further buoyed by emerging local and federal grant programs.[15]

Haag fully embraced the political aspects of landscape architecture and would apply the public advocacy lessons learned from the market campaign to advocate for his vision for an abandoned gas plant at the northern tip of Lake Union. Haag's transformation of Gas Works Park in the 1970s set a worldwide precedent for postindustrial landscape remediation. It was also a watershed moment for the history of urban design in Seattle. For the first time, Seattle's relationship with its natural context, and its industrial past, was expressed aesthetically and experientially in a design that honored both. Moreover, Haag layered social and civic functions into the site, in addition to allowing for ecological and recreational performance.

Turning Point

The small peninsula jutting into the north end of the lake—once known as Brown's Point—was industrialized beginning in 1906, when the Seattle Gas Light Company built a plant to convert coal and oil into gas. This was despite the

recommendations of John C. Olmsted, who had advocated in 1903 that the point be preserved as a park due to its stunning views. Later a tar refinery was also added to the point, the soil and groundwater of which had become extraordinarily toxic by the time the plant closed in 1956. At that juncture, Seattle—and, in particular, the neighborhood of Wallingford—had a very negative relationship with the plant, having received its clouds of black smoke for decades.

Haag first became involved in 1962, when the city agreed to a 10-year purchase contract for the property, proposing to transform the heavily polluted site into a new public park. City leaders initially imagined scraping the landscape entirely clean: removing the towers and excavating and transporting thousands of cubic yards of polluted soil off-site. Instead Haag argued that the abandoned gas towers were what made the site unique, sacred—part of its genius loci.[16] Through an extensive public outreach campaign that engaged artists and student designers, he changed Seattle's perception of its abandoned infrastructure: The community began to understand the historic structures as sculpture, an art form that interacted with the landscape and celebrated Seattle's unique industrial prowess and dramatic natural setting.[17]

ABOVE: View of the abandoned gas plant at the north end of Lake Union, 1966. (Seattle Municipal Archives, 29085)

BELOW: Crowds gather on Kite Hill for a 4th of July celebration, 2015. (Photo by TIA International Photography; Seattle Municipal Archives, 177326)

Instead of removing the soil, Haag designed a landscape that would contain and clean the toxic ground over time. Remediating the soil where possible with beneficial bacteria and organic matter, Haag piled up the most contaminated soils and debris into a high cone. Capped with an 18-inch layer of clay and topsoil, the cone was designed to prevent water infiltration into its highly toxic core; the idea here was to prevent the movement of the toxins into the lake. Instead, the great mound—later called Kite Hill—was designed to shed water as efficiently as possible. The rest of the park was designed to channel storm water into gentle valleys, where it could infiltrate and support the bacteria remediating the soil. The function of the landscape therefore defined its form.[18]

In addition to articulating the site's ecological function, Haag transformed existing structures to serve diverse members and needs of the community. The extant machinery in the exhauster-compressor building was painted in bright colors and converted to a children's play barn. The boiler house was equipped with tables, grills and sinks intended to be used both by families and by the homeless.[19] The civic and urban performance of the park was as much of a concern as its ecological function.

Viewed in the context of Seattle's urban development, Gas Works emerges as a pivotal project that is rooted in the city's history while setting the stage for its civic future. A powerful earth-moving gesture on par with those of R.H. Thomson—though an interesting inversion in the landform—Gas Works proposes an industrial, environmental and, especially, urban reconciliation that emphasizes the human experience of this city.

This article was adapted from a lecture delivered to the Washington Chapter of the Association of Professional Landscape Designers on June 1, 2015. Part 3 will appear in our Fall 2016 issue and explore the legacy of Seattle's design history through a selection of recent projects.

Betsy Anderson is a Seattle-based landscape architect for the National Park Service. She is also a member of the "Bulletin" Editorial Board.

NOTES

[1] Matthew Klingle's "Emerald City" (New Haven, Yale University Press, 2007) provides a thorough overview of the various factors that motivated projects such as the regrades and the Lake Washington Ship Canal. See also Part 1 of this article, "Completing Nature's Outline," in the spring 2016 issue of the "Bulletin."

[2] Welford Beaton, "The City That Made Itself," 1914. Quoted in Klingle, "Emerald City," 44.

[3] Woodbridge and Montgomery, "A Guide to Architecture in Washington State," 12–13.

[4] The work of Ellsworth Storey in the early 1900s is widely considered the exception. See Woodbridge and Montgomery, "A Guide to Architecture in Washington State," 17.

[5] For an overview of Northwest Modernism and its influence on contemporary Northwest architecture, see David E. Mille , "Toward a New Regionalism: Environmental Architecture in the Pacific Northwest" (Seattle: University of ashington Press, 2005). See also the 2010 documentary "Modern Views: A Conversation on Northwest Modern Architecture," produced by the University of Washington.

[6] Quoted in Miller, "Toward a New Regionalism," 7.

[7] Miller, "Toward a New Regionalism," xvi, 6. See also "Modern Views."

[8] See "Modern Views."

[9] Woodbridge and Montgomery, "A Guide to Architecture in Washington State," 36.

[10] Miller, "Toward a New Regionalism," 27.

[11] For a description of the Magnolia Branch library and Haag's collaboration with Kirk, see Thaïsa Way, "The Landscape Architecture of Richard Haag: From Modern Space to Urban Ecological Design" (Seattle: University of Washington Press, 2015): 125–26.

[12] Way, "The Landscape Architecture of Richard Haag," chapters 5 and 6.

[13] Ibid., chapter 2. [14] Ibid., 108. [15] Ibid., 106–108. [16] Ibid., 150. [17] Ibid., chapter 9. [18] Ibid., 161–162. [19] Ibid., 164.

Q&A from the
Miller Library's Plant Answer Line

A Flower's Vanishing Scent

By Rebecca Alexander

This regular column features Q&A selected and adapted from the Elisabeth C. Miller Library's Plant Answer Line program. If you'd like to ask a plant or gardening question of your own, please call (206) 897-5268 (UW Plant), send it via the library website (www.millerlibrary.org), or email directly to hortlib@uw.edu.

QUESTION: I wonder why my roses have lost their fragrance. My 'Double Delight' roses used to have a good smell. Now the flowers are bigger, and there is no fragrance.

ANSWER: It does seem mysterious that a once-fragrant rose should lose its scent. 'Double Delight' is a hybrid tea rose known for its intensely spicy aroma. (It was the winner of the American Rose Society's James Alexander Gamble Fragrance Award in 1986.) If we rule out changes in the senses of the gardener smelling the rose (such as advancing age or sinus troubles), there are a number of possible reasons for your rose's vanishing fragrance.

According to "The Graham Stuart Thomas Rose Book" (Timber Press, 1994), rose scent itself is complex and is composed mainly of geraniol, along with many other substances. It is mainly released from tiny cells on the surface of the petals: "Scent is produced mainly in the petals and is given forth when the growth of the flower and the atmospheric conditions are right. From this it will be seen why double roses have more volume of scent than singles [...] scent is especially apparent in most flowers when the air is neither too cold nor too hot [...] In extreme conditions, such as wilting, extra scent may be released [...] Usually the best fragrance is obtained from a newly opened flower growing on a healthy, well-established plant on a windless day when growth is exuberant [...] we may expect fragrance to be at its best on a day when the air is warm and moist rather than dry, when the plant will be functioning well. It is not that moist air conveys better than dry, but that the plant is giving it forth in greatest quantity."

When you discovered the rose had no scent, were the atmospheric conditions optimal for the release of scent? If scent is most prominent on healthy plants, are there any underlying reasons (pests; diseases; cultural problems, such as overwatering, poor soil, etc.) the plant might not be at its strongest?

The loss of fragrance, combined with the different appearance of the flowers, makes me wonder if the rose might have been grafted, and the flowers you are seeing (and not smelling!)

are on stems coming up from the graft, but this is pure speculation.

Another cause you might not have considered is environmental pollution. This is an increasing problem, not only for humans whose lives are enriched by the scented plants in their gardens, but also pollinators who depend on floral scents for information. Air pollution affects not only our own sense of smell, but the fragrance emitted by flowers, as described in a 2008 study published in the journal "Atmospheric Environment."

> *"The scent molecules produced by flowers in a less polluted environment, such as in the 1800s, could travel for roughly 1,000 to 1,200 meters; but in today's polluted environment downwind of major cities, they may travel only 200 to 300 meters," said Jose D. Fuentes, a professor of environmental sciences at the University of Virginia and a co-author of the study. "This makes it increasingly difficult for pollinators to locate the flowers." The result, potentially, is a vicious cycle where pollinators struggle to find enough food to sustain their populations, and populations of flowering plants, in turn, do not get pollinated sufficiently to proliferate and diversify.*

(Quoted from an article about the study in the "University of Virginia Today," April 10, 2008.)

Preventing air pollution might seem an insurmountable challenge, but there are small things you can do in your home and garden to improve air quality:

- Use electric or hand-operated gardening tools instead of gasoline-powered machines.
- Don't idle your car near your garden (or anywhere else).
- Don't use laundry products with added synthetic fragrances. (Volatile organic compounds from dryer vents are common sources of pollution that most people don't even think about.)
- Choose zero-VOC or low-VOC materials if you are painting your house or treating a deck.

If your rose continues to be scentless, you might want to add more of them to your garden, as well as a selection of other fragrant plants that will appeal to you and the pollinators. When attracting pollinators, remember flower shape is also important. Bees, for instance, prefer single flowers (see sidebar), such as those found on wild roses like *Rosa rugosa* or *Rosa nutkana*.

Flowers That Appeal to Bees

According to "California Bees & Blooms," by Gordon Fromke et al., there are four flower morphologies and arrangements that appeal to bees: open platform (think Asteraceae), pollen-bowl (such as Malvaceae and wild roses), buzz-adapted flowers (those whose anthers require buzz pollination to release pollen, such as *Penstemon* and *Arctostaphylos*), and bee-access flowers (think Lamiaceae and Scrophulariaceae). The more diverse your garden plantings are, the better the conditions are for beneficial insects, pollinators, other wildlife, and the health of the garden itself.

Rebecca Alexander is the Plant Answer Line librarian at the Miller Library, located in the UW Botanic Gardens' Center for Urban Horticulture (3501 NE 41st Street, Seattle). She is also a contributing editor to the "Bulletin."

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Award-Winning New Books *for* Pacific Northwest Gardener

By Brian R. Thompson

A few years ago (in the Spring and Summer 2012 issues of the "Bulletin"), I highlighted in this column some of the recent award-winning books on horticulture and other plant sciences. There are two major organizations that give these awards: the American Horticultural Society (AHS) and the Council on Botanical and Horticultural Libraries (CBHL).

The AHS awards are narrowly focused on gardening. The CBHL awards have a broader scope and include some very weighty botanical tomes aimed at researchers. The following reviewed books are some of the recent winners or highly rated titles selected from those two award programs. Most of these are not by Pacific Northwest authors, and some are a significant investment. Nonetheless, I would recommend these as good additions for home garden libraries in our region or for reading in the Miller Library.

Ginkgo

Perhaps the most iconic of trees, the ginkgo has long deserved a book of its own. This has also been a long-time goal of Peter Crane, a former director of Kew Gardens, who wrote "Ginkgo: The Tree That Time Forgot." Much of his book discusses the fossil records of the ginkgo, its one-time vast range around the globe, and its subsequent diminishing to near extinction.

This story has a link to our region in its reference to the Ginkgo Petrified Forest State Park near Vantage, Washington, which is especially unusual because of the presence of preserved wood. Most fossil sites only have leaves. Even closer to home, in the Arboretum, ginkgo is the iconic plant for China in the Entry Gardens of Pacific Connections, and there is also a fine example of the tree at the parking lot entry of the Graham Visitor Center.

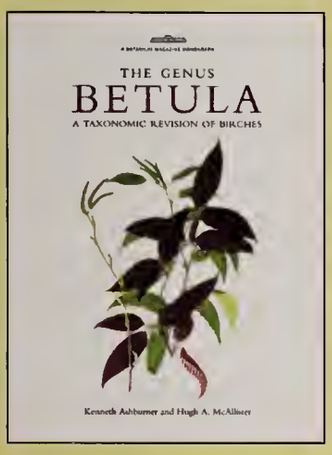
The research shows that the genus *Ginkgo*, now monotypic (contains just a single species), once comprised several species and several closely related genera. No close relatives are living today. Despite considerable interest in this topic, "...exactly how ginkgo fits into the grand scheme of plant evolution remains elusive."

While Crane does a good job telling the evolutionary story, he is at his best in his accounts of the cultural impacts of this tree on humans. This is perhaps because he and his family lived near the "Old Lion" at Kew, a ginkgo planted in 1761 and considered the oldest in the United Kingdom. Many specimens of ginkgo mark temples and other holy places throughout China and Japan—the only countries where it has managed to survive from antiquity. Since its rediscovery and revival in western cultures, it has also become an important landmark in North America, for example the giant specimen that Frank Lloyd Wright built his home around in Oak Park, Illinois.

The awe this tree inspires is captured in the author's description of Hōryō Ginkgo, in northern Honshu, Japan. "It is approached with reverence down an aisle of closely spaced, moss-covered stepping-stones. Local people visit it regularly...they explain the tree's legends to local schoolchildren, and they work to spread word of its importance. This tree was a friend to their

grandparents; it will probably also be a friend to their grandchildren."

The ginkgo's role in human lives continues to evolve. The male ginkgo, free of odorous fruit, has become a popular street tree in urban centers throughout the temperate world. Many consider roasted ginkgo nuts to be a delicacy, and the seeds have been used in traditional Asian medicine for centuries, despite a low level of toxicity. More recently, and mostly in the West, the leaves have become the focus of potential medicinal benefits, with an extract considered to be a memory enhancer.



Birches

The Royal Botanic Gardens, Kew, has published a series of excellent monographs (in-depth botanical books about a single genus or, occasionally, a few closely related genera). While of high quality—and we have them all in the Miller Library—none match the level of enthusiasm displayed by the authors of "The Genus Betula: A Taxonomic Revision of Birches."

While most monographs are written by intensely academic researchers, one of the co-authors of "Betula" was garden designer Kenneth Ashburner, whose passion was for birches planted in a designed setting. His frustration with the confusion surrounding the plants in the nursery trade was a driving force in his authoring this book. His co-author, Hugh McAllister, is a more traditional tree botanist (having written an earlier monograph on *Sorbus,* the mountain ashes), but demonstrates his own passion as he marvels over a genus that spans the colder parts of the northern hemisphere.

The result is a book that will serve a wide range of interests. It is excellent for learning more about the many birches in the Arboretum. (We have at least 50 known taxa plus many hybrids and unknown species in the collection.) Each species is described with the expected botanical precision, but there is much, much more, including information on ethnobotany and natural history, cultivation techniques, and conservation status.

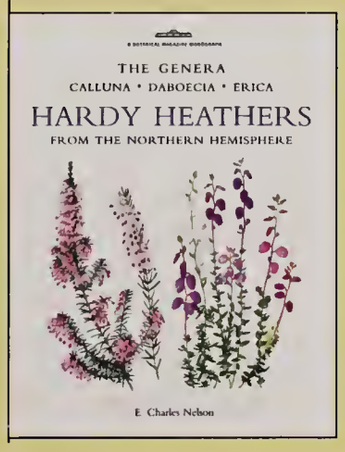
This book is also handy when shopping for a birch. Recognizing that buyers are drawn to white-barked saplings, the authors discuss the comparative "whiteness" of various selections and the age that popular nursery stock needs to be to achieve whiteness. The authors are keen about other colors, too, encouraging the use of copper to orange or even pink-colored forms of *Betula utilis.* The remarkable peeling habits of different species are praised as well, as is the showiness of the catkins and fall color.

One of the best features of these Kew monographs is the uniformly superb illustrations. In addition to high-quality photographs and numerous diagrams, paintings by Josephine Hague make "Betula" a very beautiful book, too.

Heathers and Heaths

"Hardy Heathers from the Northern Hemisphere" is another book in the Kew series with equally beautiful artwork, but the sources of these paintings are quite different from "Betula." Many were done in the 1980s by Christabel King, a highly regarded English botanical artist, for a proposed monograph that was never published. These paintings typically include multiple specimens, in combinations that were chosen for their artistic merit but not always their botanical relationships. Many other illustrations are even more historical, dating back as far as the 16th century.

While this detracts a bit from the overall organization, it does make this book visually rich. In addition to the paintings, there are excellent photographs of heather habitat and flower close-ups, lots of range maps, and very detailed diagrams. (I never knew the tiny bits of a heather or heath could be so fascinating!)



Author E. Charles Nelson includes the genera *Calluna, Daboecia* and *Erica* in his broad definition of "heather," has a great deal of curiosity for the range of forms of his subject, and is eloquent in his language: "...gardeners have an ineluctable fascination with the anomalous, even the monstrous and bizarre..." Some 30 examples of these genera are planted at the Arboretum; many of these can be found in or near the Winter Garden. Although Nelson considers his interests to be primarily botanical and historical, he includes a lengthy appendix of award-winning cultivars and liberally sprinkles cultivation notes throughout.

His discussion of the folklore of heather is also fascinating. Have you ever wondered why white heather is considered such a lucky charm? Many have, and Nelson gives a thorough review of the history behind this idea.

Cyclamen

I have become smitten with *Cyclamen*. Both *C. hederifolium* and *C. coum* have been spreading throughout my sun-dappled and shady garden, providing both brilliant flower color when most needed and an endlessly fascinating pattern of leaves throughout much of the year. There is a lovely spread of *C. coum* in the Winter Garden and, as many Arboretum fans may remember, they were also a favorite of long-time director Brian Mulligan.

There have been several good growing guides about this genus published over the last 30 years, but none are as monumental as "Genus Cyclamen in Science, Cultivation, Art and Culture." The title only begins to capture the wide scope of this book. It is edited by Brian Mathew—well known for his many books on various bulbs—and he does a skillful job of linking together the writing and illustrating skills of over 30 individuals.

Like all good monographs, this is first a superb botanical guide to the many species in the *Cyclamen* genus, featuring highly effective photographs that show habitat and various naturally occurring forms. Also included is an extensive guide to cultural requirements, both in the garden and the greenhouse, with reports from around the world by major growers and exhibitors.

The "Art and Culture" section is where the book breaks new ground. The earliest illustration of a cyclamen dates to the 6th century, and the plant has been a popular visual subject of herbals and botanical books ever since. The book section features excellent reproductions of these early

The AHS Annual Book Awards Program

The American Horticultural Society (AHS) has a long history of reviewing and recognizing outstanding books both for professionals and hobbyist in horticulture. The most ambitious project celebrated the 75th anniversary of the organization (in 1997) with a list of "75 Great American Garden Books," an excellent resource for choosing gardening books published in the 20th century. This list is available on the AHS website (www.ahs.org/awards).

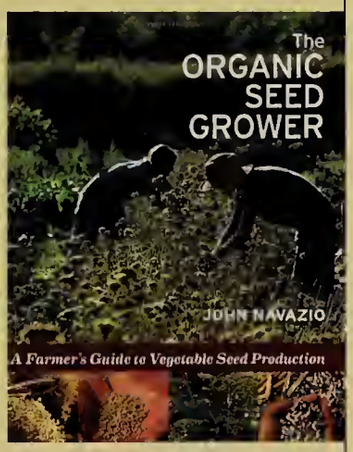
The society has continued with its Book Awards ever since, typically selecting from three to six each year, restricted to those books published in North America. Announced in the March/April issue of "The American Gardener," the winners are chosen by a committee of horticulturists, garden designers, nursery owners, garden writers and librarians and are reviewed for "...qualities such as writing style, authority, accuracy, and physical quality." The announcements include insightful feedback from the committee as to why each book was selected, and all of the winners can be found in the collection at the Miller Library.

images. It also provides a surprisingly detailed history of botanical illustration and printing practices in western cultures.

In more modern times, cyclamen can be found decorating many media, from pottery to jewelry to decorative cards. Reading this monograph, I discovered that Eugene Kozloff, local author of several books on Pacific Northwest native plants and marine life, is also passionate about cyclamen and has an extensive collection of cyclamen postage stamps.

Growing your own Vegetable Seeds

If you are already an avid veggie grower, and especially interested in organically grown, open-pollinated varieties, I recommend you read "The Organic Seed Grower" by John Navazio. This is not a beginner's book, but it will build on the experience you have, especially if you decide to save your own seeds.



This is also one of the best books for learning about the biology of vegetable crops. The encyclopedia section is not in the expected alphabetical order, but instead is grouped by plant families, each with an introduction to the broadly shared characteristics within the family. A detailed natural and cultivated history of each featured plant is included along with the growth habits and reproduction methods (I didn't realize that so many of our favorite vegetables are biennials), with the emphasis—as the title suggests—on growing some plants on for seeds.

Navazio writes for a national audience, but he is a local writer living in Port Townsend, Washington. Many of the examples and photographs are from the region, including those of small-scale farmers you may meet at local farmers markets. Some advice is impractical for home gardeners (it's hard to provide a mile of isolation between squash varieties on an urban lot), but reading this book will give you a depth of understanding and greater appreciation of the fascinating plants you are growing for your salads and stir-fry recipes.

Why write a book like this? Navazio sums this up in his introduction: "My hope is that I have been able to deliver this information in a simple enough fashion to be easily understood and used, while at the same time remaining scientifically based...I'll know that I've been successful in this when I see a dog-eared, dusty, and smudged copy of this book on the front seat of a seed farmer's pickup truck."

Brian R. Thompson is the manager and curator of the Elisabeth C. Miller Library of the University of Washington Botanic Gardens. He is also a member of the "Bulletin" Editorial Board.

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